Ontario

ORDER NO. 90-001

JANUARY 1990

AGDEX 231/634

Factsheet

90-05001/

Pest Management Program for Grape Series

POWDERY MILDEW OF GRAPE

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Photographs courtesy of Agriculture Canada, Vineland Station; N.Y.A.E.S. Geneva, N.Y. and OMAF, Plant Industry Branch, Vineland Station.

Powdery mildew of grapes is a serious disease caused by the fungal pathogen *Uncinula necator*. In Europe the same disease is known as Oidium after the latin name *Oidium tuckeri* given to the summer or conidial phase of the fungus. Grape powdery mildew infects only species of *Vitis* (grape) and closely related plants. Powdery mildew is quite distinct from downy mildew, caused by the fungus *Plasmopara viticola*, and the two fungi cause quite different symptoms, and have very different cultivar susceptibilities and fungicide sensitivities.

BIOLOGY

In Ontario, the fungus has two spore forms. The summer conidial form or Oidium stage has the dusty or powdery appearance after which this disease is named, and has a strong mouldy smell. The powderiness is caused by the summer spores (conidia) formed in upright chains from the fine white mycelium that spreads rapidly outwards from the point of infection (Figure 1).

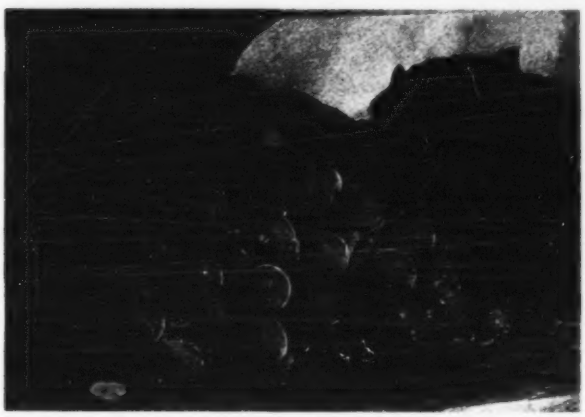


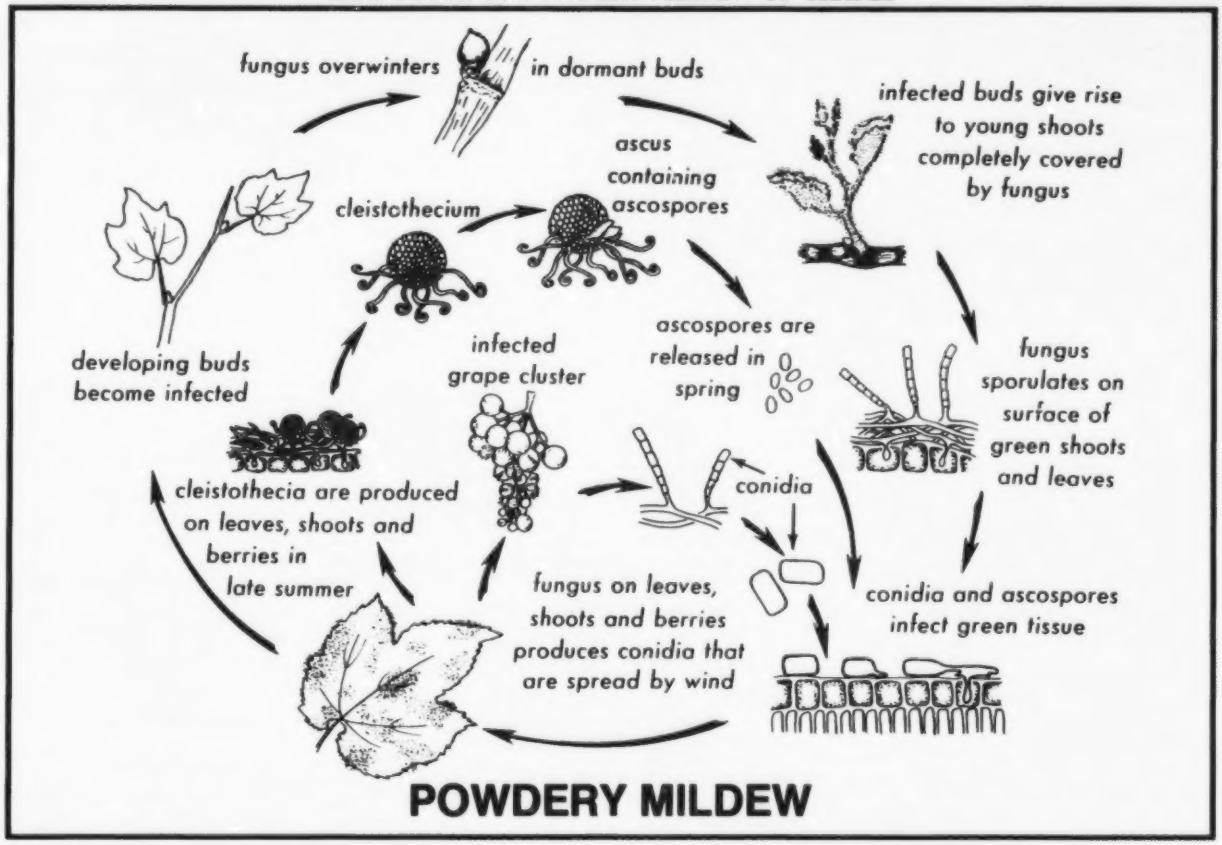
Figure 1. Powdery mildew on leaves and fruit.

The second form is the perfect (sexual) stage consisting of numerous very small round structures (cleistothecia) about 0.1 mm in diameter. Cleistothecia develop during late summer on infected leaves, changing from white through orange to black as they mature (Figure 2). In the fall, many of the mature cleistothecia are dislodged from the leaves and some become trapped in the small fissures in the old bark of the trunk and side arms of the vine. The overwintering cleistothecia in bark fissures germinate in the spring to release the sexually-formed ascospores. Additional ascospores may be released from cleistothecia on overwintering leaves on the vineyard floor. In Europe, cleistothecia are not formed and the principal sources of primary inoculum are overwintered infected buds which occasionally give rise to young shoots covered by white powdery spores resembling the primary inoculum of apple powdery mildew. However, this means of overwintering has not been seen in Ontario.

Figure 2. Overwintering cleistothecia on leaf.

Powdery mildew is most serious during hot dry summers, whereas downy mildew is associated with cool damp rainy weather in the spring or late summer. The germination of powdery mildew spores does not depend on dew or rain which actually reduce germination. Instead the spores germinate best at high humidity (90-100% RH), with some germination occurring even as low as 40% RH. The temperature range for powdery mildew development is 6-33°C with an optimum temperature of 25°C. At temperatures above 33°C the spores and mildew colonies are killed.

LIFE CYCLE OF POWDERY MILDEW OF GRAPES


fungus overwinters
in dormant buds
infected buds give rise to young shoots completely covered by fungus
ascus containing ascospores
cleistothecium
developing buds become infected
ascospores are released in spring
infected grape cluster
fungus sporulates on surface of green shoots and leaves
conidia
cleistothecia are produced on leaves, shoots and berries in late summer
fungus on leaves, shoots and berries produces conidia that are spread by wind
conidia and ascospores infect green tissue
POWDERY MILDEW

Drawing by R. Sticht, reprinted by permission from Compendium of Grape Diseases, American Phytopathological Society, St. Paul, Mn. 1988

CROP DEVELOPMENT STAGES AND DISEASE SYMPTOMS

1. Leaves Infections may occur on the upper leaf surface shortly after the stage of postbloom (early July). They are indistinct white patches of fine mycelium, 5-10 mm in diameter, but they increase rapidly in size and produce conidia within 5-10 days. Lesions can be distinguished from dust or pesticide deposits by viewing the leaf in bright light and by looking almost along the surface of the leaf. The lesions are conspicuous by their shiny or glistening appearance (Figure 3).

Figure 3. Young powdery mildew lesions on upper leaf surface.

Powdery mildew infections occur less frequently on the lower leaf surface and are especially difficult to see on cultivars with hairy leaves. Late season infection of leaves may cause them to be cupped upwards and to remain small.

2. Shoot lesions These are usually smaller than those on leaves and are often overlooked until they darken and turn black in the late summer and fall (Figure 4). Severely infected shoots desiccate during the winter resulting in winter-damaged canes.

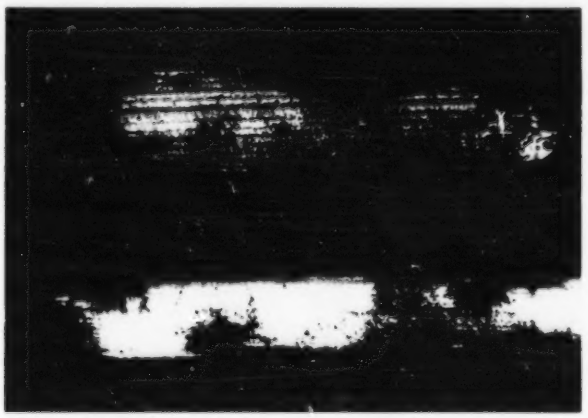


Figure 4. Darkened lesions on canes in late summer.

3. Berries and clusters In early to mid-July, powdery mildew may first appear on aborted berries or more commonly on pea-sized berries in the dense, shaded lower part of vines (Chardonnay) (Figure 5). On very susceptible vinifera cultivars early berry infection may be very damaging, resulting in russetted berries (Figure 6) that fail to develop or mature normally, and may split (Figure 7) and rot from Botrytis infection. Infected berries of red cultivars fail to colour normally and have a mixed maturity. Severe powdery mildew infection of the bunch stalk (rachis) may give off-flavoured juice and wine.

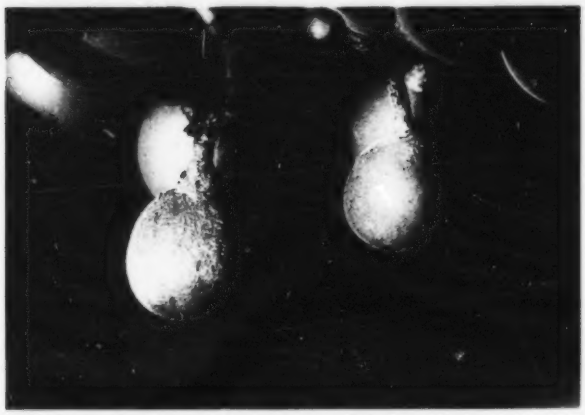


Figure 5. Early infection on pea-sized berries.

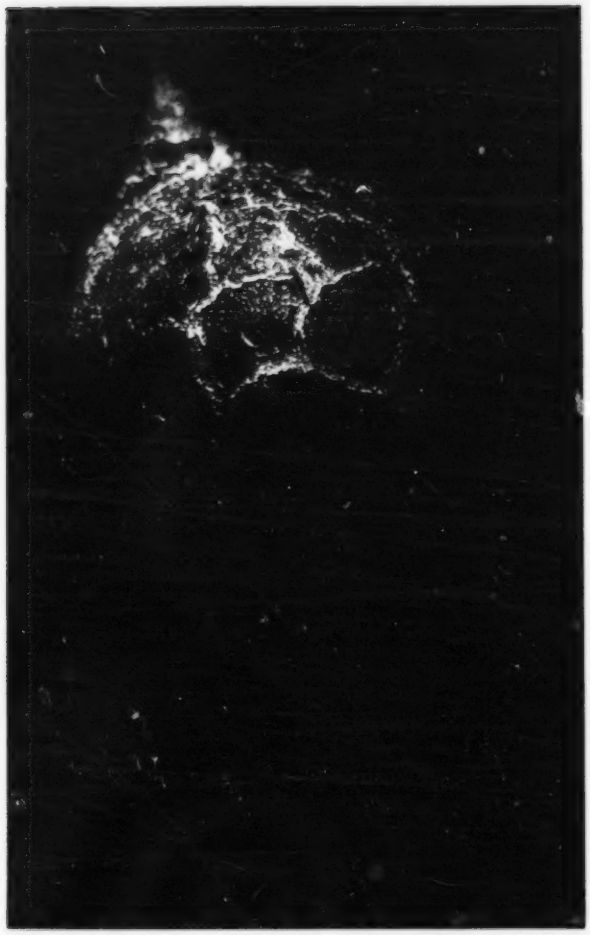


Figure 6. Berry russetted from powdery mildew infection.

Figure 7. Berries split from powdery mildew infection.

CULTIVAR SUSCEPTIBILITY

The North American grape, *Vitis labrusca* is susceptible to powdery mildew but it is much more tolerant than the European cultivars of *V. vinifera*. Interspecific hybrids are somewhat intermediate in their susceptibility. A listing of cultivar susceptibility is given in OMAF Publication 360, *Fruit Production Recommendations*.

CONTROL

Good cultural practices can reduce the seriousness of powdery mildew. An open planting site with many hours of direct sunlight will help reduce infection. Planting rows in the direction of the prevailing summer winds will improve air movement. Spring and summer pruning and training of vines to reduce shading and to allow rapid air movement can reduce the frequency and duration of periods of high humidity which favor the disease.

Control of powdery mildew is achieved primarily by applying effective fungicides prior to infection on a protective schedule. Application generally begins at the postbloom stage (early July), followed by a second spray 7-12 days later. For moderately susceptible cultivars these two applications may be sufficient unless severe infection of adjacent plantings occurs.

Very susceptible cultivars require protection at least every 10-14 days commencing at postbloom until mid August. Fungicides should not be used during the 4-6 week period prior to harvest, so as to minimize the residues on harvested fruit and to improve wine quality.

During warm fall weather one or two postharvest sprays may be advantageous on vinifera cultivars (Chardonnay, Gamay, Riesling) as protection against late cane infection and to reduce winter injury. A listing of currently available fungicides is given in OMAF Publication 360, *Fruit Production Recommendations*.

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ISSN 0225-7882